Technology and depression: an application as a tool for health care

Tecnología y depresión: una aplicación como herramienta para el cuidado de la salud

A tecnologia e a depressão: um aplicativo como ferramenta para cuidado em saúde

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Abstract

The aim was to develop an application for mobile devices as an instrument to support family and close friends of depressed people with potential risk of self-extermination. Applied research of technological production aimed at developing an application for a mobile device that provides information on risk factors for suicidal acts and guidelines applied. The application, developed by the adapted Scrum method, informs the possible manifestations and behaviors of the person at risk, through information provided by the user, through a platform in the chat format, mediated by a virtual agent. The application developed for the use of family members or people close to those with depression and risk of self-extermination can provide access to education for the population and families regarding the manifestations suggestive of the unfavorable evolution of depression. Therefore, it is necessary to carry out a detailed study with the evaluation of experts to analyze its quality and usability. It is expected that this application can reach a standard of excellence in meeting the needs of users as an instructive and updated tool, based on evidence, offering quality assistance and harm mitigation.

Descriptors: Mobile Apps; Health Education; Suicide; Biomedical Technology; Information Technology.

Resumén

El objetivo fue desarrollar una aplicación para dispositivos móviles como instrumento de apoyo a familiares y allegados de personas deprimidas con riesgo potencial de autoexterminio. Investigación aplicada de producción tecnológica orientada a desarrollar una aplicación para dispositivo móvil que brinde información sobre factores de riesgo para actos suicidas y pautas aplicadas. La aplicación, desarrollada por el método Scrum adaptado, informa las posibles manifestaciones y comportamientos de la persona en riesgo, a través de información proporcionada por el usuario, a través de una plataforma en formato chat, mediada por un agente virtual. La aplicación desarrollada para uso de familiares o allegados con depresión y riesgo de autoexterminio puede facilitar el acceso a la educación de la población y las familias sobre las manifestaciones sugestivas de la evolución desfavorable de la depresión. Por ello, es necesario realizar un estudio detallado con la valoración de expertos para analizar su calidad y usabilidad. Se espera que esta aplicación pueda alcanzar un estándar de excelencia en la satisfacción de las necesidades de los usuarios como una herramienta instructiva y actualizada, basada en evidencias, ofreciendo asistencia de calidad y mitigación de daños.

Descriptores: Aplicaciones Móviles; Educación para la Salud; Suicidio; Tecnología Biomédica; Tecnología de la Informacion.

Resumo

Objetivou-se desenvolver um aplicativo para dispositivo móvel como instrumento de apoio à família e amigos próximos de pessoas depressivas com potencial risco de autoextermínio. Pesquisa aplicada de produção tecnológica destinada a desenvolver um aplicativo para um dispositivo móvel que disponibilize informações sobre os fatores de risco para o ato suicida e orientações aplicadas. O aplicativo, desenvolvido pelo método Scrum adaptado, informa as possíveis manifestações e comportamentos da pessoa com risco, mediante informações prestadas pelo usuário, por meio de uma plataforma no formato de chat, mediada por um agente virtual. O aplicativo desenvolvido para a utilização de familiares ou pessoas próximas àquelas com depressão e risco de autoextermínio pode proporcionar acesso à educação para a população e as famílias em relação às manifestações sugestivas da evolução desfavorável da depressão. Para tanto, faz-se necessário, um estudo destalhado com a avaliação de especialistas para análise da sua qualidade e usabilidade. Espera-se que esse aplicativo possa alcançar um padrão de excelência no atendimento das necessidades dos usuários como uma ferramenta instrutiva e atualizada, baseada em evidências, oferecendo qualidade na assistência e mitigação de danos.

Descritores: Aplicativos Móveis; Educação em Saúde; Suicídio; Tecnologia Biomédica; Tecnologia da Informação.

Introduction

In the relationship between information and health, mental traumas resulting from natural disasters are misunderstood or may not be recognized. For such recognition, it is necessary to learn and study mental health, which linked to the development of care and, in turn, is fundamental for health promotion and disease prevention.[1].

The technological advance in the urban environment and its increasing use in everyday life has become notorious, mainly as a tool for the implementation of education. In the field of health, technology has taken on the role of an instrument that facilitates information. In this context, nursing, as a transmitter of information and care, becomes a link between families and access to the health care network, thus developing a fundamental role in harm reduction in society, having technology as a means facilitator[2].

This technology, in turn, has innovated the way education and teaching are implemented in the new generation, becoming increasingly necessary in the health area[3].

Despite several technological and communication advances, the mental illness of the population remains in evidence. Depression, characterized by a mood disorder, governs the attitudes of its victims and changes their perception of themselves, causing them to visualize and assimilate certain problems in an exacerbated way. Its diagnosis is facilitated due to the presence of signs and symptoms; however, its dynamics and origin can raise questions that result in misinterpretations, hindering a possible treatment[1].

As a consequence of depression, suicide is a problem that is difficult to approach in society due to the difficulty of family members to discuss the subject, especially because of shame or contempt for what happened, making it a challenge to be overcome against prejudice[4].

Data from the World Health Organization (WHO) reveal that in the last ten years the number of people with depression has increased by 18.4%, and in Brazil 5.8% of the inhabitants have the disorder, representing the highest rate on the Latin American continent[5].

Another relevant point is the common lack of preparation of people close to the individual in a situation of suicidal crisis, which is due to the lack of a clear understanding of the disease, of how the individual in such a situation should be approached, as there is no demand for constant educational update on mental health in emergency care services[6,7].

When considering information technologies, resources such as software have expanded, consolidating themselves as an innovative area in the praxis of care, with an important contribution to the effective accessibility of information with the benefit of reducing time[8].

Considering the mentioned challenges, providing access to education for the population and families in relation to the suggestive manifestations of the unfavorable evolution of depression through the development of an application for mobile device, called App save lives, is the central objective to be discussed in this article.

Methodology

This article develops an applied research of technological production aimed at developing an application for mobile devices that provides information about risk factors for suicide, a dangerous development of depression.

In the course of studies in the area, several product development methods were generated. Among them are agile methods, commonly known as lightweight methods - due to their flexibility and ease of adaptability when compared to traditional ones - indicated for scenarios where there is constant change in requirements and the need for quick results.

Often these methods divide development into several iterations of shorter cycles, also called sprints within the Scrum method. At the beginning of each new cycle, the programmer can make changes to the requirements, so that the customer gets an understanding that adds to their knowledge of the product to be developed. Thus, there is feedback from the customer to the development team, which reduces project risk[9].

Currently, Software is often used as a basic tool in the administration of economic and social processes, for this reason its implementation must be effective and safe, in addition to being a way of organizing, systematizing and planning any project, company or application. Scrum, as a simplified and accessible method for beginners in the area of program development, becomes an indispensable tool in this case[10].

Scrum is divided into 3 parts: 1 - Transparency, when everyone knows the steps to be taken and what will be accomplished within the project; 2 - Inspection, throughout the project it is necessary to observe what is being carried out with daily meetings; 3 - Adaptation, which happens throughout the project, if necessary, for Scrum to fit the initial idea. In addition to these elements, the basic roles of the method studied are product owner, scrum master and dev team[11].

The product owner is the leader who has the maximum power, that is, the only one with the power to decide which features and functionality will be built and in what order they should be done, keeping a clear vision of what the team is and showing what is sought with the project. The scrum master is the person who helps the team understand the values and principles of the work. The dev team represents the people who will actually build the project, explaining how what they were directed about will be executed[12].

This dynamic works when the product owner describes what he envisioned and, with the help of the scrum master, all the necessary functionalities for the project are broken down. The list of features is called the product backlog, this being the first artifact. It is organized according to the priority of each functionality, which can be divided starting with the imprescriptible and of great importance[11].

Another artifact to mention is the sprint backlog, the list of activities that need to be done during a sprint. The project is entirely planned in sprints, pre-established periods of time, where some product backlog items are selected to

be executed. Ideally, each sprint should have the same length of time, 2 to 4 weeks[12].

To complement these elements, there is also the sprint planning, a team meeting that takes place before the beginning of each sprint to prepare the sprint backlog, that is, which features the team can deliver within the time determined by the sprint. In these meetings, each team member answers three basic questions: "What did I do yesterday to help the team keep up with the on-time delivery?"; "What did I do today to help?"; "Is there any impediment to reaching the sprint goal?"[11].

Another event is the Sprint Review, the review and validation of what is being delivered according to the expectations presented in the sprints, where everything is updated. Finally, a retrospective is carried out, which aims to verify the adaptation needs of the project development process, considering everything that was done, positive and negative. The Scrum method, therefore, represents an option for agile development when knowledge of the requirements for programming is insufficient, that is, when it is not known what is necessary to generate the expected result and the technology is more complex, making it difficult to master it through desired development[12].

As this is an application development study, without the evaluation of its usability by specialists, there was no need for an evaluation by the Ethics Committee, as there was no involvement of human beings, as recommended by Resolution No. 466 /12 of the Ministry of Health, which promotes ethical recommendations for conducting research involving human beings, therefore, without the need for Free and Informed Consent from the research subject and/or legal representative.

Results

For the development of the application, between August and November 2021, although not yet patented, we chose to use the adapted Scrum method, where the researchers represented the scrum master and the product owner, and the programmer, the dev team. .

The following sprints were carried out database modeling; class and service layer development; mobile application development; interface design; infrastructure implementation. All sprints lasted one week.

Due to its extensibility and modularity, the database used for the modeling was PostgreSQL, a tool that acts as a management system for related databases and that allows the implementation of the SQL language in structures, ensuring work with the standards of this type of data ordering[13,14], as shown in Figure 1.

Figure 1. Database used in application modeling. São Paulo, SP, Brazil, 2021
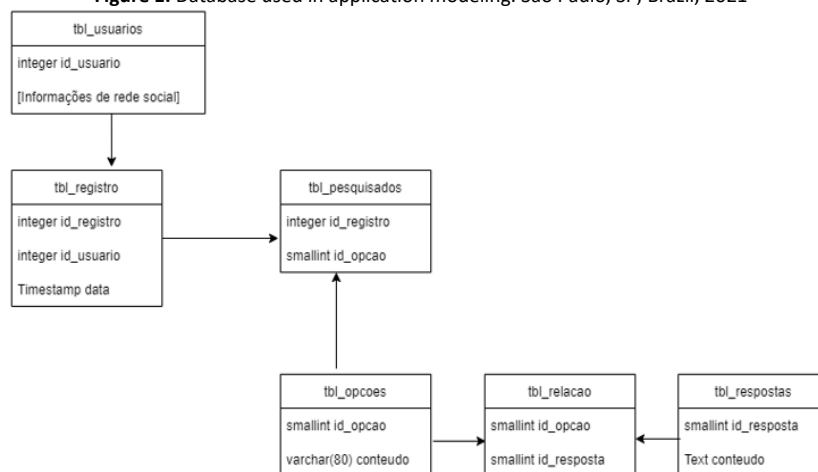
Source: Adapted from Milani[15].

The information stored in this database may be used for statistical analysis and, based on these analyses, new tools may be developed. A database that is easy to maintain and develop is ideal for this type of enhancement[16].

For the basic functioning of the program, only tables tbl_options, tbl_responses and tbl_relation are needed. They are responsible for storing the contents of the answers and options and which ones are related to each other. As soon as a user completes a list of options, either in the first or second phase of the application, they will be searched in the relationship table how much each answer scored[17].

The other tables store information about the social network with which the user authenticated, in addition to what was searched for by the user and when. These structures aim to store statistical information for study, in addition to demonstrating possible new application tools.

The programming language used was Java and the middleware, Tomcat, widely used, confirming the suitability of the application to possible adaptations that may happen, favoring the implementation of future tools.

For each layer, two servers were implemented, for contingency reasons. It is estimated that this number of servers is enough to handle the application's demand, as long as each server has at least 8GB of memory and four processors. For hosting the services, the Amazon AWS cloud service was chosen.

Sprint planning

The application's home screen starts with user identification and offers two options: option 1 is the choice

to identify yourself, informing the way you want to be called, the age, municipality, state and gender that defines you. This information is intended to facilitate the quantification of users by region for a brief data collection and probability analysis; option 2 is the choice of not identifying the user.

In a second moment, a warning text is displayed, evidencing that if any sign of suicide detected in the victim is alarming, communication about the clinical condition to health professionals is necessary. In short, any psychiatric or psychological treatment that the victim is currently using is not ruled out.

The dynamics of the mobile application takes place within a platform in the form of a chat. In order for the interaction between the user and the system to happen more naturally, a virtual agent was inserted that appears at certain times, so each interaction gap was divided into speech bubbles.

Figure 2. App home screen. São Paulo, SP, Brazil, 2021

On the main screen (Figure 2), after opening the application and possible identification of the user, a speech icon starts the presentation of the virtual agent, which cites and explains the social factor that involves the desire to commit suicide.

The second icon starts the chatbot and has the purpose of determining the behavior that the victim is presenting, the level of this suicidal behavior, and bringing behaviors and solutions at the end (Figure 3). The chatbot dynamic starts with a short sentence that needs to be completed by the user, clicking on the icons that most coincide with its victim.

The application presents 19 manifestations of suicidal behavior: distant thoughts; lack of hope or purpose; to see life as something without purpose; the victim asks the user if they will miss her; interest or research on death; removal of the victim from people or moments that were pleasant; isolation attempts; romanticization of death; verbalization about no longer wanting to be part of the social environment in a fixed way; the victim having experienced a very stressful moment of loss or failure; lack of emotional support from friends/family; higher frequency of alcohol/drug consumption after a frustrating episode; several verbalizations of the death wish; planning some suicidal act that went wrong; verbalization of the idea chosen to carry out the suicidal act; verbalization or clues about what a possible suicide would be like; resolution of pending matters and dismissals; suicide attempt in which the victim gave up due to some specific factor or condition; suicide attempt interrupted by third parties; suicide attempt and completion due to impulsive state in a desperate situation

Figure 3. App screen that determines level of suicidal behavior. São Paulo, SP, Brazil, 2021
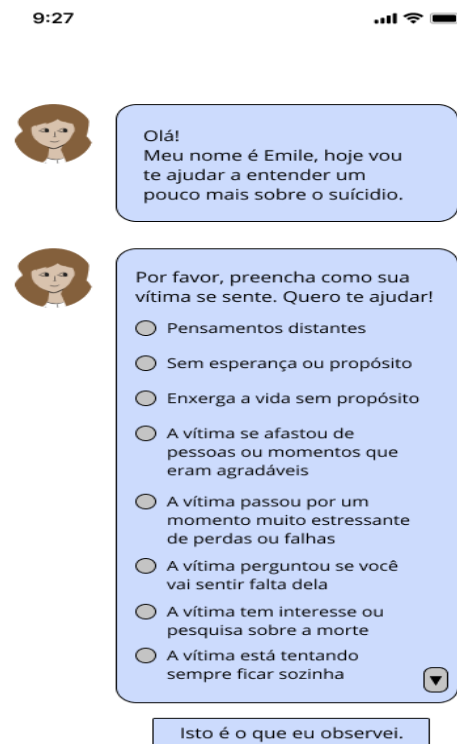
For programming, the following points of concern were taken into account: aesthetic appearance of the avatar; prevent user evasion by providing information and solutions in the same tab; creation of a prototype item in the menu for first aid in different situations.

At the end of the interaction, if the victim's suicidal behavior shows a high risk or it is a situation where the victim tried to commit the act (Figure 4), first aid teachings are shown to the user, so that he can provide first aid in the event of a new occurrence of the episode.
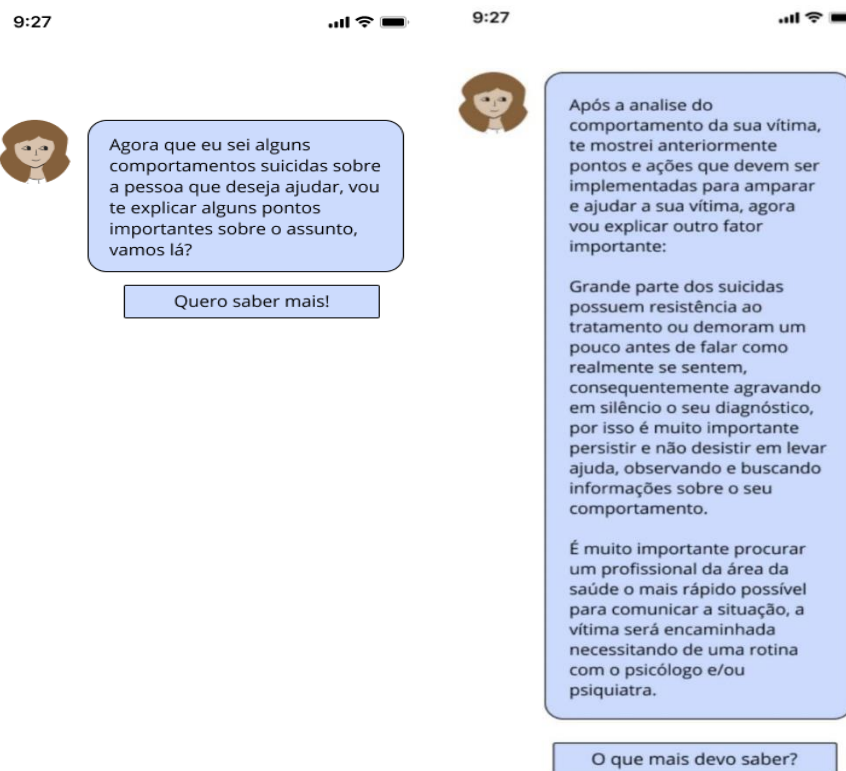
Figure 4. Application screen that highlights the risk of suicide. São Paulo, SP, Brazil, 2021
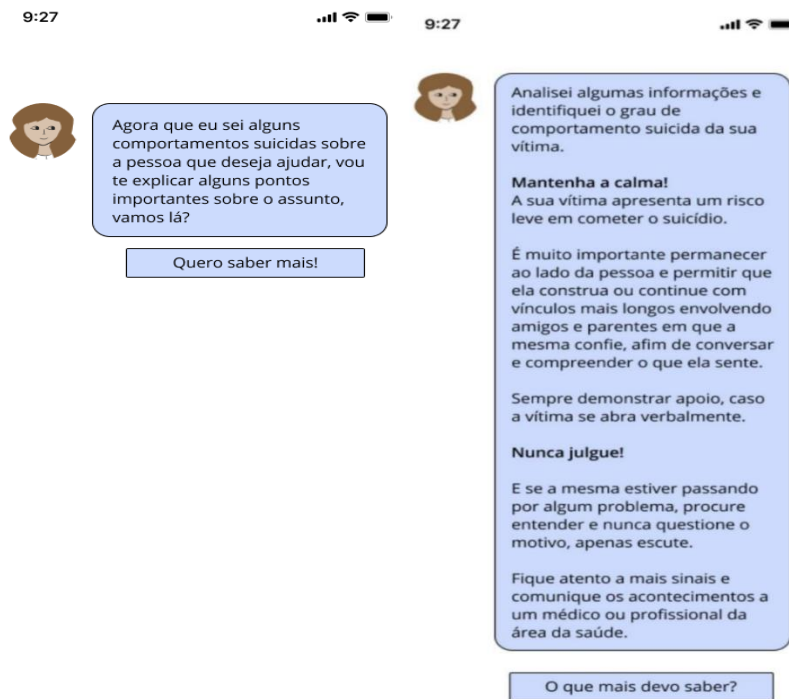
At the end of the chat and after screening the victim's level of suicidal behavior, an explanation of the suicidal level is addressed to the user, as well as an indication of a solution (Figure 5).

Figure 5. Suicide level solution and guidance screen. São Paulo, SP, Brazil, 2021

The application was developed based on the levels of suicidal behavior in psychopathology, the response for each level of behavior was directed to its level of complexity between mild, moderate and severe[18]. Characterized as mild are thoughts of death and suicidal ideas; as a moderate degree, death desires and motivations; and as a serious degree, suicidal intentions, suicide plans, impulsive acts and completed suicide. Each degree of complexity leads to an answer and a solution for a given situation (Figure 6).

Figure 6. Application screen with responses and solutions for identified suicidal behavior. São Paulo, SP, Brazil, 2021
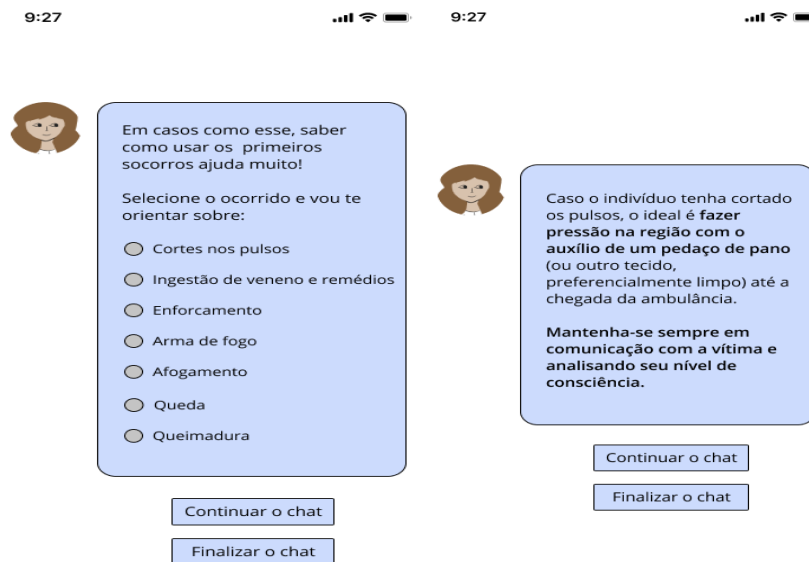
For mild manifestations - which are distant thoughts, lack of hope or purpose, seeing life as something without purpose, the victim's withdrawal from people or moments that were pleasant and the victim having experienced a very stressful moment of loss or glitches - the app's response will say: "Keep calm! Your victim is at a slight risk of committing suicide. It is very important to stay by the person's side and allow them to build or continue with longer bonds involving friends and relatives they trust, in order to talk and understand what they feel. Always show support if the victim opens up verbally. Never judge! Moreover, if she is having a problem, try to understand and never question the reason, just listen. Stay tuned for more signs and report the events to a doctor or health professional", with further information on how to support and help the victim: "Even with a slight risk, be aware of the evolution of the behavior that your victim presents, mental illness evolves silently, requiring greater attention to signs and behaviors. At this stage, the victim needs emotional support, but it is important that their privacy is respected so that they do not feel suffocated. Support her and stay by her side in a natural way. If necessary, contact the Life Appreciation Center (CVV), available 24 hours a day by phone (188) and at the following times via chat (https://www.cvv.org.br/chat/): Sunday - from 5 pm to 1 am; Monday to Thursday - from 09:00 to 01:00; Friday - from 3pm to 11pm; Saturday - 4pm to 1am.*"*

For the manifestations of moderate degree - namely: the victim asking the user if he will miss her, interest or research on death, attempts at isolation, romanticization of death, verbalization about not wanting to be part of the social environment in a fixed way, lack of emotional support from friends/family - the app's response will say: "Keep calm, your victim is at moderate risk of committing suicide. It is very important to stay by the victim's side and allow them to remain with longer bonds with friends/relatives they trust to talk to. Always show support, if the victim opens up verbally never judge and if she is going through a problem, try to understand and never question the reason, just listen. Stay

tuned for more signs, report the events to a doctor/health professional", with the following guidance: "Most of the suicidal people are resistant to treatment or take a while before talking about how they really feel, consequently worsening in silence diagnosis, so it is very important to persist and not give up on the victim, entering and studying their behavior. It is very important to look for a health professional as soon as possible to communicate the situation, the victim will be referred, needing a routine with the psychologist and psychiatrist. If your victim continues to have suicidal thoughts or behavior after all psychiatric treatments, talk to the responsible professional about possible hospitalization, seek opinions from other doctors. If necessary, contact the Life Appreciation Center (CVV), available 24 hours a day by phone (188) and at the following times via chat (https://www.cvv.org.br/chat/): Sunday - from 5 pm to 1 am; Monday to Thursday - from 09:00 to 01:00; Friday - from 3pm to 11pm; Saturday - 4pm to 1am.*"*

To determine the severe degree, in turn the most advanced and delicate, the application considers the behaviors: higher frequency of alcohol/drug consumption after a frustrating episode, several verbalizations of the death wish, planning of a suicidal act that went wrong, verbalization of the idea chosen to carry out the suicidal act, verbalization or clues about what a possible suicide would be, resolution of pending issues and goodbyes, suicide attempt in which the victim gave up due to some specific factor or condition; suicide attempt interrupted by third parties; suicide attempt and completion due to impulsive state in a desperate situation. The app will respond: "Keep calm, your victim is at serious risk of committing suicide. It is very important to stay by the victim's side and allow them to remain with longer bonds with friends/relatives they trust to talk to. Never leave her alone, always show support, if the victim opens up verbally, never judge, and if she is going through a problem, try to understand and never question the reason, just listen. Stay tuned for more signs, report the events to a doctor/health professional", with further information: "Most of the suicidal people are resistant to

treatment or take a while before talking about how they really feel, so it's very important persist and do not give up on the victim, entering and studying their behavior. It is very important to look for a health professional as soon as possible to communicate the situation, the victim will be referred, requiring a routine with the psychologist and psychiatrist. Create a trust with the victim, be positive, do not place your frustrations or problems on her, as any situation can create a trigger for the victim to see an opportunity with reasons to commit the suicidal act. If your victim continues to attempt suicide after all psychiatric treatments, talk to the responsible professional about possible hospitalization, seek opinions from other doctors. If necessary, contact the Life Appreciation Center (CVV), available 24 hours a day by phone (188) and at the following times via chat (https://www.cvv.org.br/chat/): Sunday - from 5 pm to 1 am; Monday to Thursday - from 09:00 to 01:00; Friday - from 3pm to 11pm; Saturday - 4pm to 1am.*"

For this situation, some functions were rethought: the way in which each answer will be delivered after defining the victim's behavior; prevent the user from writing multiple answers simultaneously, limiting the answer to one question at a time.

The interaction will be terminated by the user after reading the response, an AI (artificial intelligence) command will be sent by the virtual agent and the user will have the option to continue in the chat or leave (Figure 7). On the home screen, the user can reopen the chat if they are not satisfied with the response obtained or still have questions (Figure 8).

Figures 7 and 8. App screen with the option to exit or continue in the chat and option in "I still have doubts", to reopen the chat. São Paulo, SP, Brazil, 2021
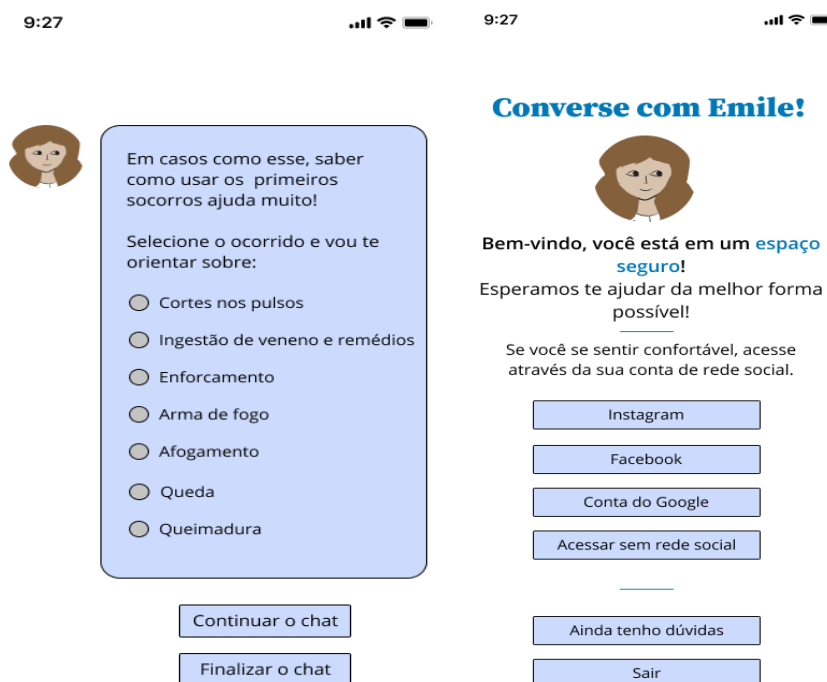
Then, the application will provide the user with small trivia and, before ending, the chat offers a brief satisfaction rating, which is optional.

The app educates the user about suicidal behavior, bringing more comfort and information. It enables understanding of the suicidal issue and the importance of suicide prevention actions, as well as first aid teachings. The chat's form of communication allows the user to adopt a questioning attitude in relation to the victim's emotional behaviors that were previously misunderstood.

Mobile applications, introduced through ICTs, promote innovation and functionality, allowing the creation of new useful, creative and unexpected links. They increase the reach of the social spaces covered, helping in various health specialties by offering information, storing clinical data and aiding in decision-making. Accompanying the user 24 hours a day, with virtual space without restrictions or physical limitations, represents an effective means of reaching the desired target audience[2-19].

Discussion

From the marketing point of view, the Brazilian software and services business is quite significant. The application is a software system, that is, a system for processing data internal to a device, which is installed in an operating system and implemented in mobile hardware devices, with hardware being the set of all physical components that make a device work, such as smartphones and tablets. This program must meet functionalities such as performance, data processing into information, task organization, agility in activities, among others[20,21].

The web application is accessed through a browser that uses the main language of the web, HTML5, which in turn allows developers to express the design of how the page elements will be displayed by the browser. It can be accessed via a URL and users choose to install the application on the home screen or create a shortcut to access it, without the need to use application resources, not taking up memory space on the device[22].

Native apps are the apps available for smartphones and tablets and can usually be downloaded from online stores such as Google Play on Android devices or the Apple Store on iOS devices. Its development brings many advantages, as it is possible to take better advantage of the hardware resources of the device on which it is installed, such as cameras, GPS and various sensors used to equip cell phones[20].

Hybrid applications are not fully developed in the specific language of each operating system. Instead, they use multiple languages, including two formats: semi-native and semi-web[23].

Currently, Information and Communication Technologies (ICTs) are widely explored in the field of health, as they provide structuring and organization of data and information, their storage and processing, in addition to access and sharing, in real or remote time, both by several professionals involved in care, as well as by the patient or user[24].

ICTs promote more accessibility when used through mobile applications. In 2019, the 30th annual survey on the use of ICTs by Fundação Getúlio Vargas found an average of two digital devices per inhabitant in Brazil. With this, information becomes accessible anytime and anywhere. In this context, the mobile application as an educational material ratifies the nurse's duty of improvement and knowledge about ICTs[25].

These resources are important because, globally, they allow the connection to several computers and transmit information quickly and simultaneously, collaborating with the development and promotion of health. Therefore, applications - also known as apps, from the English application - are used as tools to perform specific tasks designed by their creators/programmers[26].

In the specific area of Nursing, the tools coming from ICTs aimed at mobile applications contribute to clinical, educational and management practice, strongly present in the cultural, social and economic context of the country[27].

Mobile applications are seen as a contemporary teaching tool, contributing to nursing management by privileging the automation of processes, in addition to increasing safety in decisions in the care process. In this case, it is important to introduce systematic care based on evidence and mediated by technology: a tool capable of providing the articulation between theory, practice and research[11].

The quality of an application must be understood as a set of attributes that need to reach a standard level of expectations and needs of its users and that adapt to their satisfaction, and can be perceived in different ways, highlighting basic aspects for a good evaluation of parameters of any type of software, both with pedagogical and technical characteristics[27].

Studies of resources and practices developed in different disciplines that can effectively contribute to their own field of knowledge and practice justify the need to develop technologies applied to care, for health treatments, constituting promising forms of intervention and education of people, impacting the quality of life of the population in general[11].

Conclusion

The application developed for the use of family members or people close to those with depression and risk of self-extermination can provide access to education for the population and families regarding the manifestations suggestive of the unfavorable evolution of depression.

A detailed study is necessary, with the evaluation of experts considering the heuristics for the quality and usability of the application. It is expected that this application can reach a standard of excellence in meeting the needs of users as an instructive and up-to-date, evidence-based tool, offering quality care and harm mitigation.

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